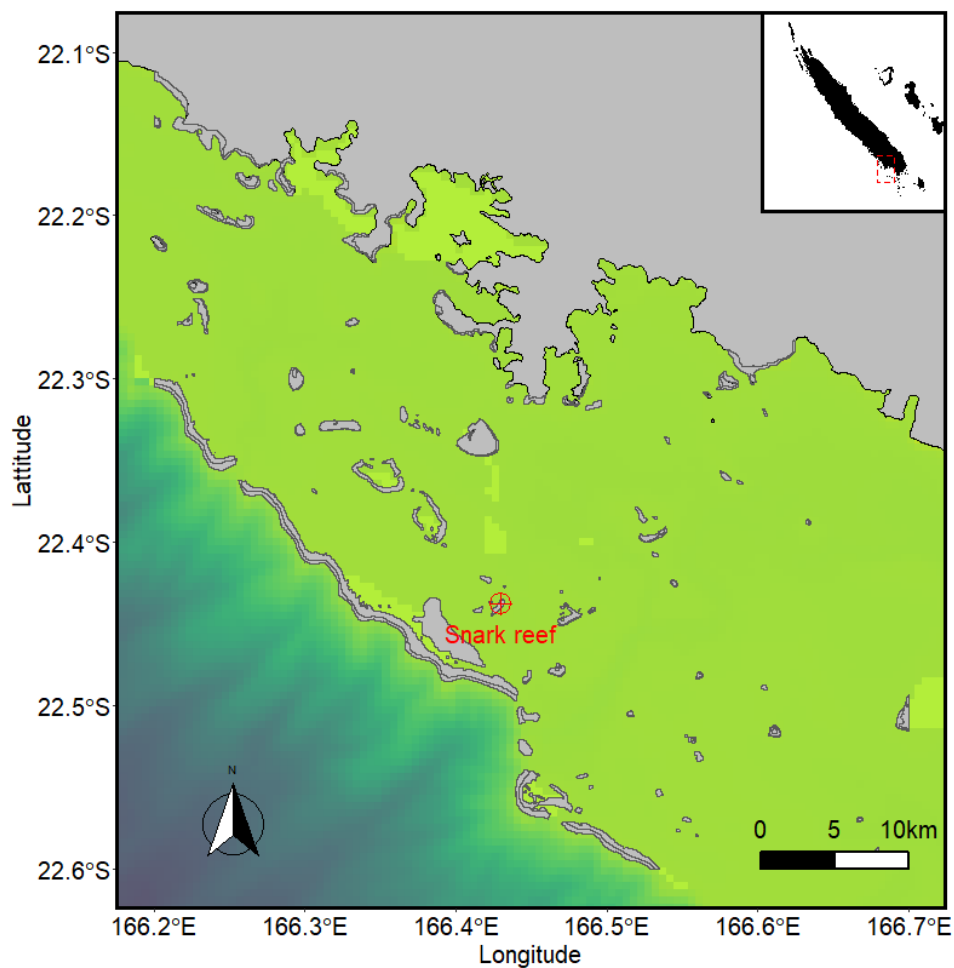


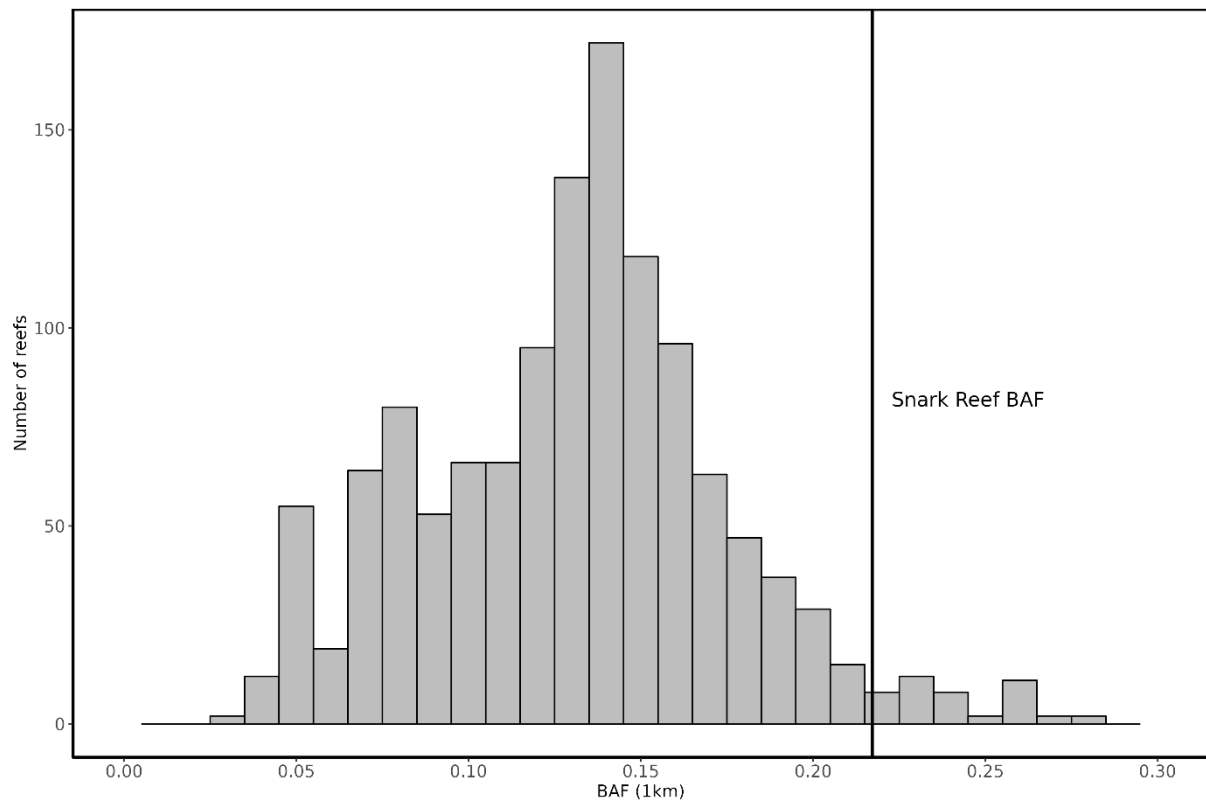
Climate adaptive loci revealed by seascape genomics correlate with phenotypic variation in heat tolerance of the coral *Acropora millepora*

### Supplementary Figures

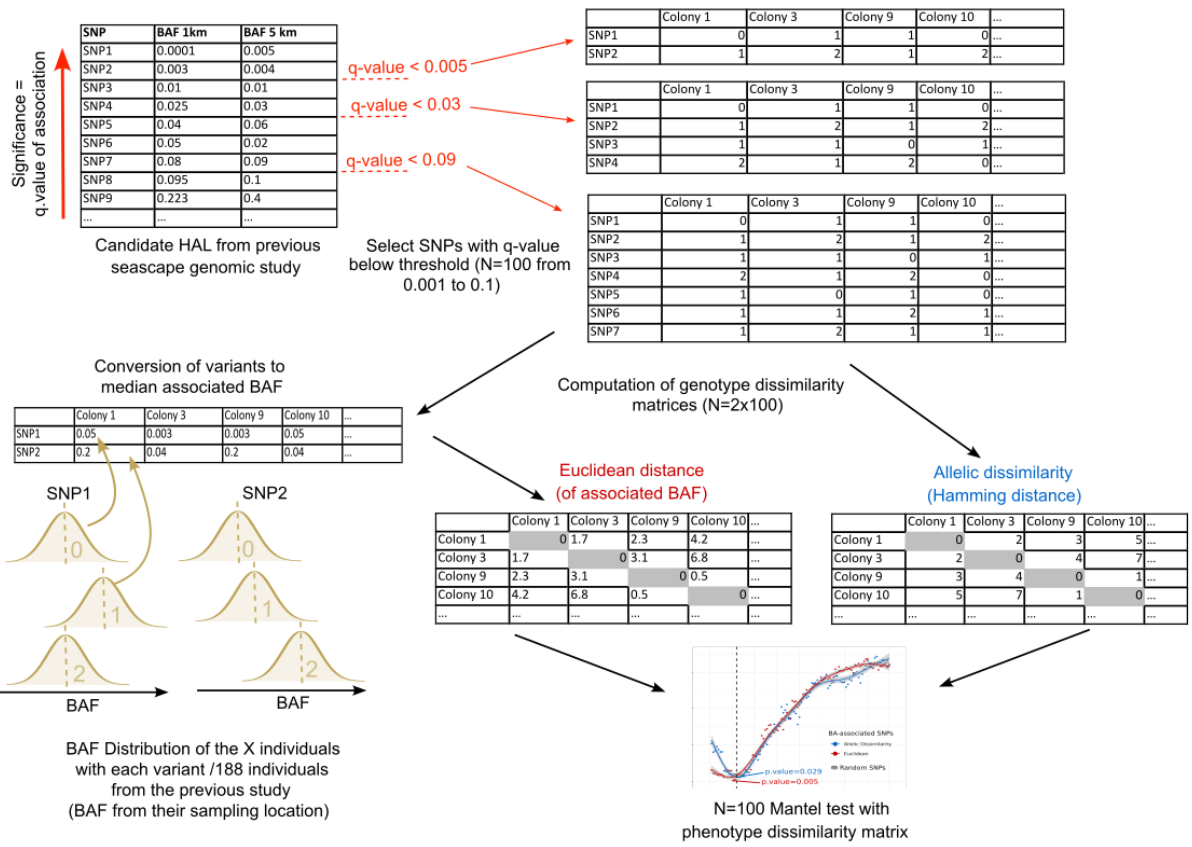
Hugo Denis<sup>\*1,2</sup>, Oliver Selmoni<sup>3,4</sup>, Hugues Gossuin<sup>5</sup>, Thierry Jauffrais<sup>1</sup>, Caleb C. Butler<sup>6</sup>, Gaël Lecellier<sup>\*\*1,7</sup> and Véronique Berteaux-Lecellier<sup>\*\*1</sup>



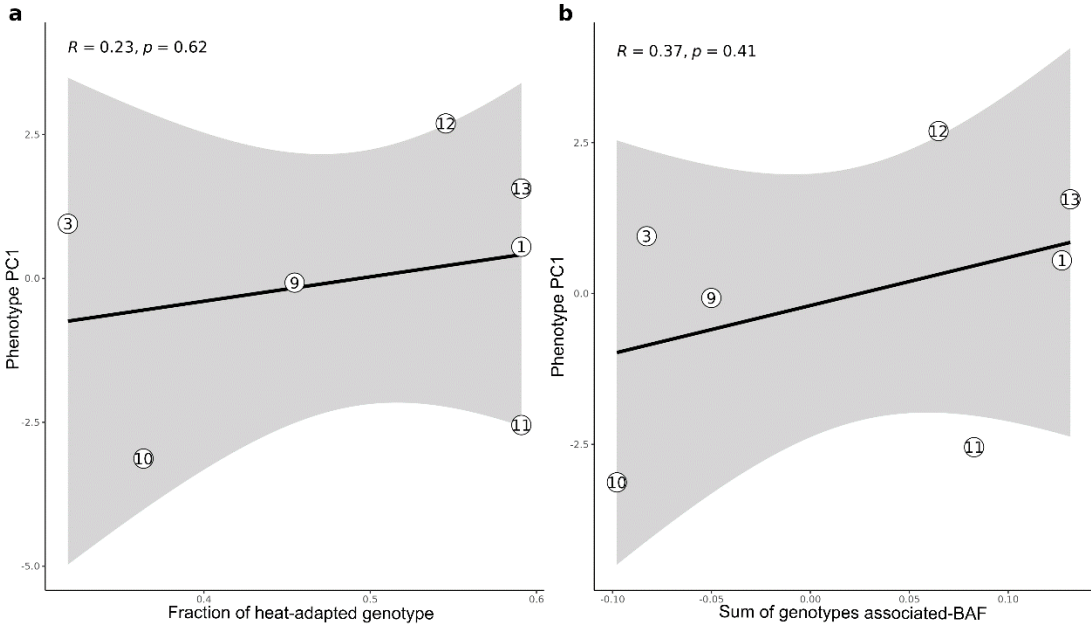
Supplementary Figure 1: Location of the sampling site (Snark reef) of the 7 *Acropora millepora* colonies subjected to a long-term heat stress assay. The reef is ~1.3 km x 0.3 km wide and located in the New Caledonian lagoon ~5.5 km from the barrier. Isobaths obtained from the SHOM are represented in shades of cyan. Reefs coordinates were recorded from UNEP database(UNEP-WCMC, 2010).



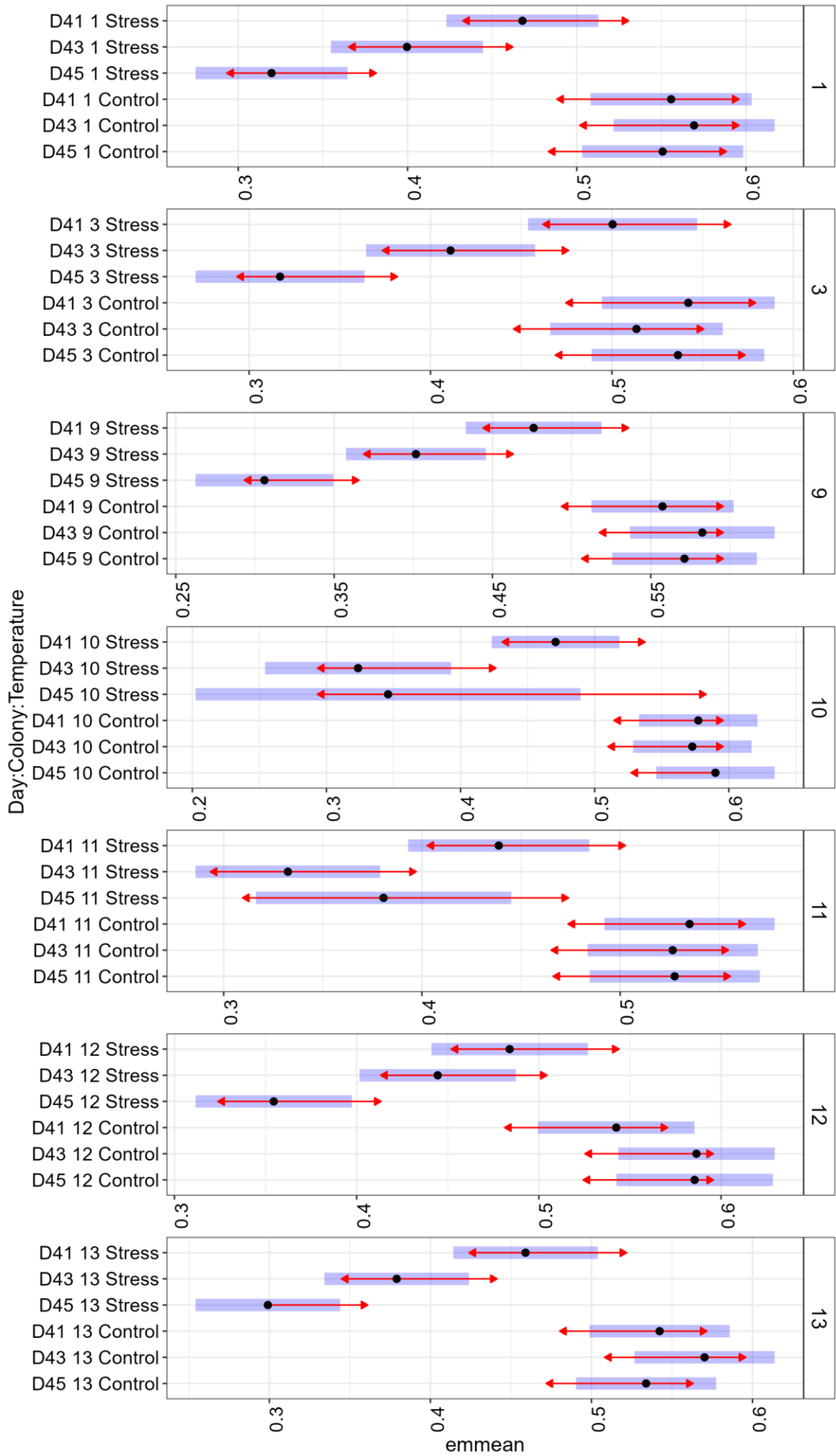
Supplementary Figure 2: Bleaching Alert Frequency (BAF) for New Caledonia reefs (N=1 285). BAF was computed at each reef pixels using daily SST records since 2002 at a 1km resolution (MUR-JPL-L4-GLOB-v4.1, Group for High Resolution Sea Surface Temperature; Chin et al., 2017) and NOAA Coral Reef Watch methodology (Liu et al., 2003). The vertical bar indicates the BAF of the study site.



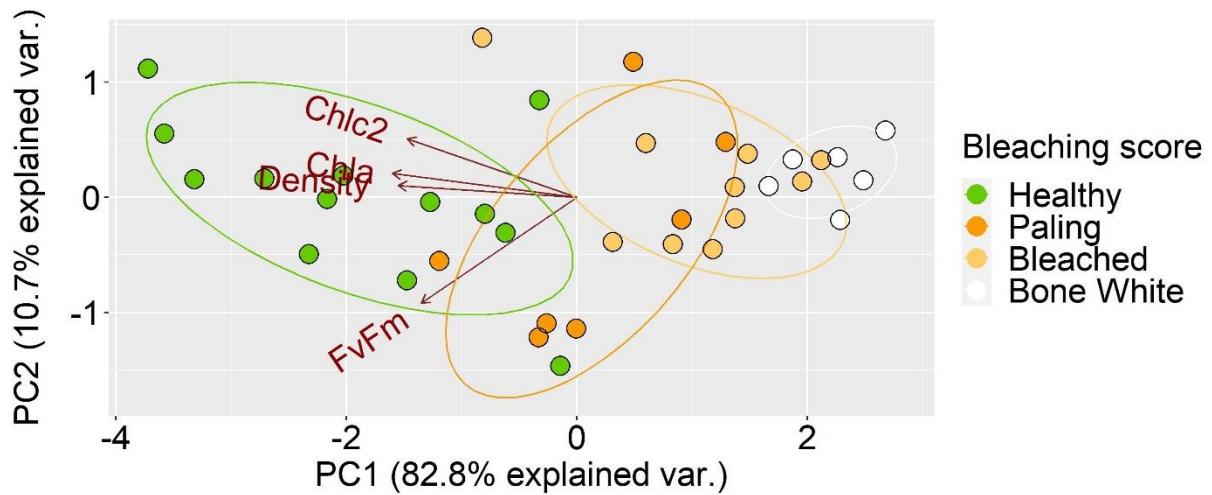
Supplementary Figure 3: Method used to compute genotype dissimilarity matrix based on sets of SNPs increasingly associated with bleaching alert frequency (N=100 for each distance metric). Each genotype distance matrix was then tested for correlation with the phenotype distance matrix using Mantel tests.



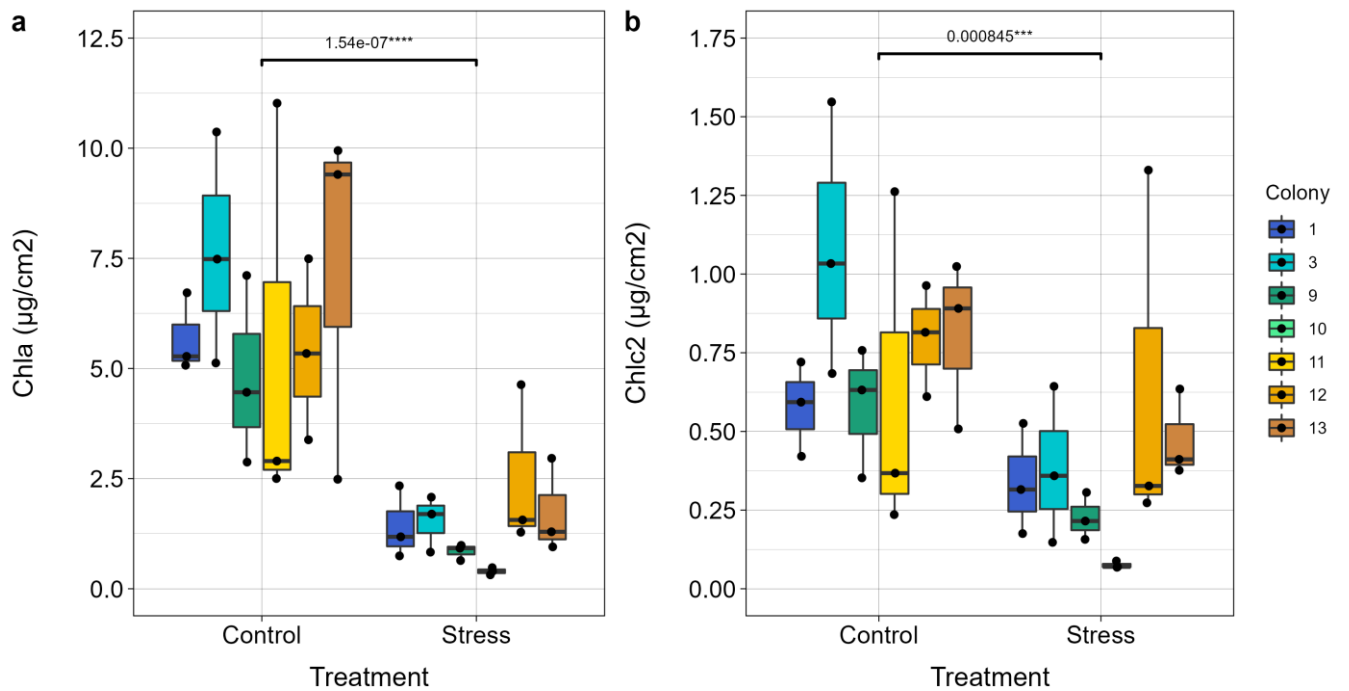
Supplementary Figure 4: Correlation between colonies phenotypic response under heat stress (1st principal component from Figure 5) and polygenic scores computed from a restricted set of 22 candidate heat adaptive loci demonstrating the best correlation between genotype and phenotype clustering. The polygenic score was computed as (a) the fraction of heat-adapted genotypes (i.e., the variant associated with the highest BAF) and (b) the sum of BAF associated to each genotype. Pearson correlation coefficient and *p. value* are indicated.



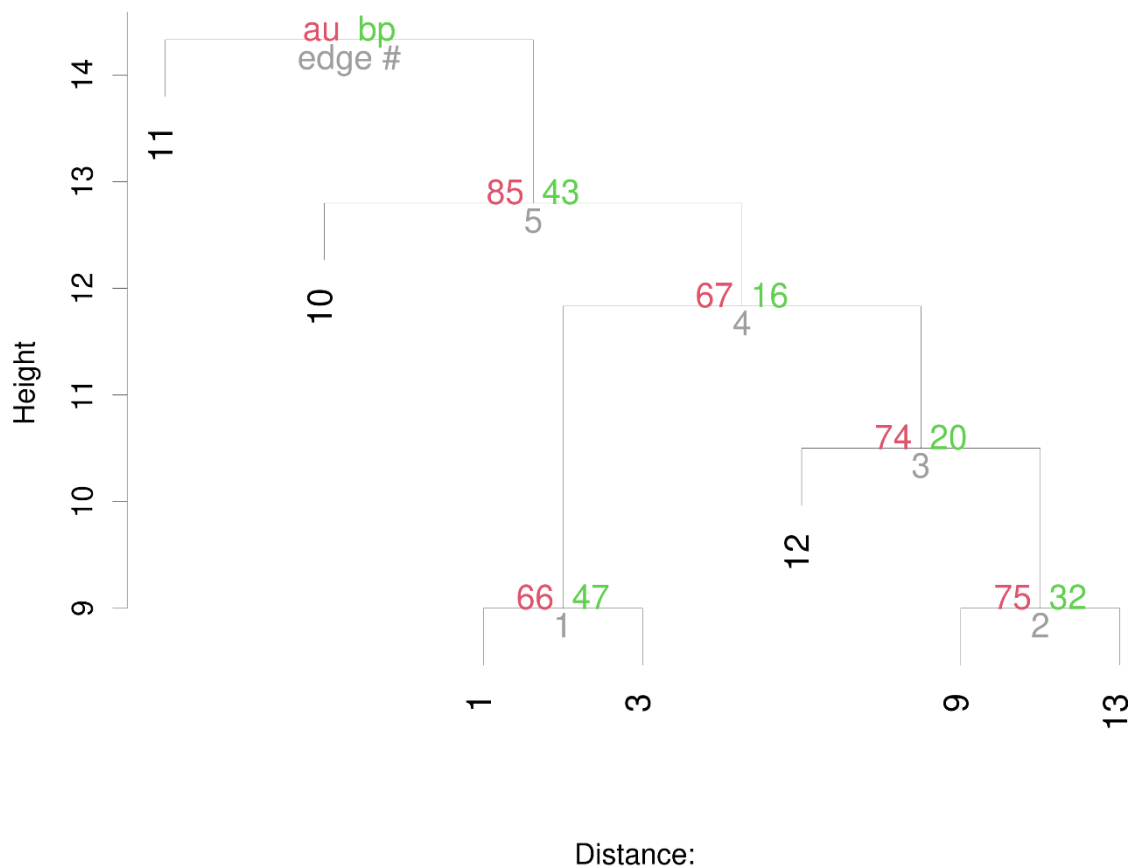
Supplementary Figure 5: Effect of MMM+4°C on colonies maximum photosynthetic efficiency. Estimated marginal means computed from *emmeans* package are shown for both treatments (stress / control) and each individual colony at the last 3 measurement points of the experiment (Days 41-45) for which treatment showed a global effect. Disjoint arrows indicate significant differences at the 0.95 confidence level.



Supplementary Figure 6: PCA components 1 and 2 of physiological parameters for the 36 nubbins sampled at the end of the experiment (3/colony/treatment). Numbers in parentheses represent the proportion of variance explained by that principal component. Samples are colored according to the bleaching score assigned visually and ellipses scaled to 95% of the data.



Supplementary Figure 7: Chlorophyll content at the end of the experiment. (a) Chlorophyll a, (b) Chlorophyll c2. Horizontal bars show significant differences between groups, multiple comparisons adjusted with Tukey post-hoc tests. P. values and significance are indicated above. Each point corresponds to individual fragments average measurements across three replicate aliquots.



Supplementary Figure 8: Hierarchical clustering of the 7 colonies based on their genotype at the 22 SNPs (average, allelic dissimilarity) with 1000 bootstrap replications. Values in red represent AU (Approximately unbiased) p-values (%) and values in green represent BP (Bootstrap probabilities) p-values (%).

## References

- Chin, T. M., Vazquez-Cuervo, J., & Armstrong, E. M. (2017). A multi-scale high-resolution analysis of global sea surface temperature. *Remote sensing of environment*, 200, 154-169.
- Liu, G., Strong, A. E., & Skirving, W. (2003). Remote sensing of sea surface temperatures during 2002 Barrier Reef coral bleaching. *Eos, Transactions American Geophysical Union*, 84(15), 137-141.

UNEP-WCMC, W.-C. (2010). WRI, & TNC.(2010). *Global distribution of warm-water coral reefs, compiled from multiple sources including the Millennium Coral Reef Mapping Project. Version, 1.*